

NASA TECH BRIEF



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Surface-Crack Detection by Microwave Methods

The problem:

To develop a surface-crack detection system that can be used to examine metallic surfaces with a non-contacting probe. Such a system has application to the continuous observation of the growth of flaws during fatigue or fracture tests.

The solution:

A microwave detection system where the microwave signal is reflected from the surface under investigation. The change in the reflected signal from the incident one is an indication of the existence of surface flaws.

How it's done:

A microwave metal-surface-flaw detector is used to irradiate a flawed metal surface by electromagnetic microwave energy. This irradiation results in re-emission of electromagnetic energy from the surface in a pattern of eigenmodes different from those of the original irradiating signal. The generation of a spatial periodic signal with a polarization modulator induces a characteristic received pattern which is correlated either with an inserted reference pattern or autocorrelated with itself to detect a change in the surface properties of the test specimen.

Notes:

1. It has been demonstrated that this microwave technique can detect flaws and scratches as small as 100 microinches. The system is noncontacting, nondestructive, and is potentially small enough to be hand carried over a surface under tests.
2. The system is under development and improvements are being made.
3. Additional details are contained in *Surface-Crack Detection by Microwave Methods* by L. Feinstein and R. Hruby, NASA, Ames Research Center; a paper presented at Sixth Symposium on Nondestruction Evaluation of Aerospace and Weapons Systems Components and Materials, San Antonio, Texas, 17-19 April 1967. Copies are available from:

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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: L. Feinstein and R. Hruby
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